

REMARKS

This is in response to the Official Action currently outstanding with regard to the above-identified application.

Claims 1 – 24 were pending at the time of the issuance of the currently outstanding Official Action in the above-identified application. Claims 2 and 10-24 were withdrawn as a result of Applicants' Response to the Examiner's Restriction Requirement (although the Examiner has not made that requirement final in the currently outstanding Official Action in view of the newly cited art). By the foregoing Amendment, Applicant has proposed the amendment of Claims 1 and 7. Applicant also has proposed the addition of Claims 25 to 32. Otherwise, Applicant has proposed the cancellation of Claims 8 and 9, without prejudice. Applicant does not propose the withdrawal of any further claims. Accordingly, Claims 1, 3-9 and 25-32 as hereinabove amended will constitute the claims under active prosecution in this application upon the entry of the foregoing Amendment.

The Claims of this application are reproduced above with appropriate status identifiers and showing the changes proposed to made in accordance with the spirit of the Rules.

More particularly, in the currently outstanding Official Action the Examiner has:

1. Not re-acknowledged Applicants' claim for foreign priority under 35 USC §119 (a)-(d) or (f), nor reconfirmed the receipt by the United States Patent and Trademark Office of the required copies of the priority documents for this application. – **Applicants note that these matters were attended to previously during this prosecution.**
2. Confirmed that the drawings as filed with this application on 5 May 2006 have been accepted.

3. Provided Applicants with a Notice of References Cited, Form PTO-892.
4. Acknowledged Applicants various Information Disclosure Statements by providing Applicants with a copy of our Information Disclosure Statements Forms PTO/SB/08a/b that accompanied those Statements duly electronically signed, dated and initialed by the Examiner in confirmation of his consideration of the art listed therein
5. Acknowledged Applicants' response to his restriction requirement. In this regard, Claims 3-9 have been reinstated as being dependent from Claim 1. Otherwise, however, the Examiner has not made his requirement for restriction final because it rests upon a reference not previously before Applicants that Applicants have not as yet had the opportunity or comment upon. In this regard, however, the Examiner disagrees with our argument that "...there is a technical relationship among the inventions of Claims 1-24 of the present application which involves a special technical feature. This special technical feature of the inventions of the present claims is that **a film of electroconductive fine particles modified with a probe is formed on and/or between electrodes provided on an electrically insulated substrate.**" – Applicants have maintained their previous withdrawal of Claims 2 and 10-24 in the present amendment.
6. Rejected Claims 1, 3 and 5 under 35 USC 102(b) as being anticipated by Vossmeier et al (US Published Patent Application No. 2002/0132361).
7. Rejected Claims 1 and 3 is rejected under 35 USC 102(a) and (e) as being anticipated by the Snow et al reference (US Published Patent Application No. US 2004/0029288).

8. Rejected Claims 1, 3-5 and 7-9 under 35 USC 102(e) as being anticipated by Wada et al (US Published Patent Application No. US 2005/0056828).
9. Rejected Claim 6 as being unpatentable under 35 USC 103(a) over the Vossmeier et al reference in view of the Primel reference (US Published Patent Application No. 2002/0115819).

Further comment regarding items 1-5 above is not deemed to be required in these Remarks.

With respect to the remaining items summarized above, on the other hand, Applicants have the following comments for the consideration of the Examiner.

Claim 1 is amended in order to specify that “a pair of electrodes” consist of a first electrode and a second electrode as described at least in original Claim 10.

Claim 1 is further amended to specify that the probe is selected from nucleic acid and a protein as disclosed at Page 11, lines 17-18 of the present specification.

Claim 1 further is amended to specify that the film is modified with the probe and that the probe contacts the film at one end of the probe. Because the presently claimed sensor is to detect a target substance which reacts with the probe, it is apparent that the probe contacts the film of the electroconductive fine particles so as to be able to react with the target substance.

Also, based on the present specification at page 11, lines 4-13; and at page 12, line 24, it is apparent that one end of the probe is used for the modification of the film via direct contact with the film via a state of nano-gap or via a specific group which modifies the end of the probe.

Claim 7 is amended so as to correct the dependency thereof.

Support for new Claims 25-32 can be found at least in original Claims 10-14 and 22-24, respectively.

The present invention relates to an electric resistance type detecting sensor which detects a target substance capable of reacting with a probe modifying a film of electroconductive fine particles, typically gold nano-particles on an electrically insulated substrate.

The principle of the detection is that upon reaction of the target substance with the probe contacting the film, the electrical resistance value of the film of electroconductive particles is altered, and this change is detected.

According to amended Claim 1, the probe is either a nucleic acid or a protein, and the probe contacts the film via one of its ends.

The prior art method for detecting DNA in a sample using electroconductive particles had the problem that either one of the target DNA or the probe DNA had to be modified with the electroconductive particles and the other had to be immobilized on the substrate by a silane coating technique or the like. Hence, it was found to be troublesome to modify every sample with electroconductive particles. Furthermore, it is difficult to change the probe contacting the substrate depending upon the type of target molecules it is desired to detect.

On the other hand, the presently claimed sensor makes it possible to detect the target substance without modifying the target substance itself using electroconductive fine particles. Further, the present sensor can be easily prepared with various different probes because the electroconductive fine particles allow easy modification with the nucleic acid or protein probe via direct contact, via a state of nano-gap or via a specific group on the end of the probe (see present specification, page 3, last paragraph).

Also, in the presently claimed sensor, a binder, if used, is comprised of the film in order to connect the electroconductive fine particles therein, and is an independent structure from the probe that contacts the film.

With respect to the cited Vossmeier reference (US Published Patent Application No. 2002/0132361), Applicants respectfully note that the Vossmeier reference relates to chemical sensors comprising a substrate on which a gold nanoparticle film is formed. The gold nanoparticle field is constituted by gold nanoparticles linked by linker molecules including a selectivity-enhancing unit that interacts with an analyte.

According to the Vossmeier reference at paragraphs [0033] to [0040], it is understood that the selectivity-enhancing unit is a chemical group that can interact with the analyte.

In other words, the selectivity-enhancing unit disclosed in the Vossmeier reference is part of the linker molecule and always is comprised in the linker molecule that connects the nanoparticles via both ends of the linker molecule (see Vossmeier at FIG. 3, for example).

However, with the formation just described, once the nanoparticle film is prepared with a certain selectivity-enhancing unit, it is difficult to change the selectivity-enhancing unit to another unit.

On the other hand, the probe is in contact with the film of the electroconductive fine particles according to the present invention. Because of this, it is possible to change the probes contacting the film of the electroconductive fine particles. This, in turn, makes it possible to change the probes contacting the film of the electroconductive fine particles and makes it possible to detect various different target substances.

Further, Applicant respectfully submits that the Vossmeier reference focuses on the detection of chemical pollutants such as toluene, acetone and the like (see Table 3 of the Vossmeier reference for example).

On the other hand, the purpose of the present invention is to detect a target substance which can react with a probe selected from a nucleic acid or protein such that it can detect nucleic acid or protein molecules. Hence, Applicant respectfully submit that the problem solved by the present invention is completely different from the problem to which the Vossmeier reference is directed thereby rendering the present invention both novel and inventive over the Vossmeier reference despite the Examiner's allegations to the contrary.

With respect to the Snow reference (US Published Patent Application No. 2004/0029288), on the other hand, Applicant respectfully submits that Snow discloses a chemical vapor sensor comprising a thin film of metallic particles surrounded by a monolayer of ligand molecules. Hence, the Snow reference is focused on the detection of an environmental chemical species such as piperidine (see Example in Snow specification).

However, the Snow reference is silent concerning the detection of a target substance that can react with the probe selected from a nucleic acid or a protein as disclosed in the present specification. Hence, Applicant respectfully submits that the present invention is novel over the Snow reference as well.

Turning now to the Wada reference (United States Published Patent Application No. 2005/0056828), it will be seen that the Wada reference relates to an organic semiconductor device that is in a completely different field of endeavor from that of the present invention that relates to the detection of nucleic acid and protein molecules. Thus, the Wada reference does not disclose a sensor for detecting a target substance, and the present invention must be considered to be novel with respect to the Wada reference.

More particularly, as the Examiner himself has mentioned, the Wada reference teaches that a nucleic acid (DNA) may be used as instead of a silane coupling agent. However, Wada teaches that another layer of fine particles and organic semiconductor molecules is made on the layer of the nucleic acid (silane coupling agent, see Figs. 18 and 20). With such a further layer on the nucleic acid, it is not possible for the nucleic acid to react with the target substance as in the presently claimed sensor.

Consequently, Applicant respectfully submits that the configuration disclosed by the Wada reference does not provide any teaching, disclosure or suggestion to one of ordinary skill in the art as of the time that the present invention was made to obtain the present invention comprising the film of electroconductive fine particles onto which the probe is modified in order to react with a target substance.

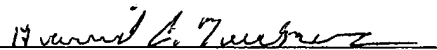
Finally, with respect to the Primel reference (United States Published Patent Application No. 2002/0115819), Applicant respectfully submits that Primel relates to polymerizable compositions for preparing a transparent polymeric substrate, and discloses various dithiol compounds. Applicant respectfully submits that the present invention is novel and inventive over the Vossmeier reference for the reasons stated above. Further, Applicant respectfully submits that the present invention is novel and inventive over the combination of the Vossmeier and Primel, the latter of which merely discloses various dithiol compounds.

Accordingly, for each and all of the foregoing reasons in view of the amendments set forth hereinabove, Applicant respectfully submits that the Examiner's currently outstanding rejections now have been overcome. Therefore, entry of the foregoing Amendment, reconsideration of this application as so amended, and allowance of the presently pending claims all are respectfully requested in response to this submission.

Finally, Applicant believes that additional fees beyond those submitted herewith are not required in connection with the consideration of this supplemental response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. 04-1105, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

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SIGNATURE OF PRACTITIONER

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